



WHAT IS CLAIMED IS:

1        1. An apparatus for distributing multicast messages  
2 associated with a multicast address among ports of a  
3 network device on the basis of a virtual local area network  
4 (VLAN), one or more VLANs within the network device are  
5 assigned to the multicast address, each VLAN having a  
6 multicast destination subset which includes one or more  
7 destination ports assigned from the ports of the network  
8 device, the apparatus comprising:

9        a means for generating a group of multicast destination  
10 ports by collectively combining every multicast destination  
11 subset within all of the VLANs assigned to the multicast  
12 address on the network device; and

13       a plurality of translation engines respectively  
14 associated with each port of the network device, each  
15 translation engine independently performing a VLAN  
16 identifier (VID) translation in parallel on each port which  
17 belongs to the group of multicast destination ports;

18       wherein the group of multicast destination ports are all  
19 of the destination ports assigned to the multicast address  
20 on the network device.

1       2. The apparatus as claimed in claim 1, the apparatus  
2 further comprises:

3       a lookup engine for mapping the multicast address to a  
4 unique index value assigned to the multicast address and a  
5 bit string representing the group of multicast destination  
6 ports;

7       a forwarding engine coupled to the lookup engine, the  
8 forwarding engine distributing the unique index value and  
9 the multicast messages to the group of multicast

10 destination ports of the network device in accordance with  
11 the bit string;

1 3. The apparatus as claimed in claim 2, wherein each  
2 translation engine associated with each port translates the  
3 VID from the unique index value and a VID-select index.

1 4. The apparatus as claimed in claim 2, wherein the  
2 lookup engine comprises an address lookup table having a  
3 plurality of entries each of which comprises the multicast  
4 address, the unique index value, and the bit string.

1 5. The apparatus as claimed in claim 2, wherein the bit  
2 string functions as a port mask, wherein each bit of the  
3 port mask corresponds to a specific port of the network  
4 device, and wherein the multicast messages are forwarded to  
5 the group of destination ports of the network device in  
6 accordance with the port mask.

1 6. The apparatus as claimed in claim 2, wherein each  
2 translation engine comprises:

3 a VID tag list corresponding to each port of the network  
4 device; and

5 a VID-select table containing a plurality of VID-select  
6 bitmap each of which corresponds to the unique index value,  
7 wherein each VID-select bitmap functions as a selection  
8 mask for the corresponding port, wherein each active bit of  
9 the selection mask is indicative of the VID-select index  
10 for each port of the network device, and wherein the VID-  
11 select index selects the corresponding VID associated with  
12 the multicast address from the VID tag list.

1       7. The apparatus as claimed in claim 6, wherein every  
2 VID-select index is respectively fetched from the VID-  
3 select bitmap corresponding to the unique index value on  
4 each port of the network device.

1       8. The apparatus as claimed in claim 2, wherein the  
2 lookup engine further comprises means for performing link  
3 aggregation complied with the 802.3ad standard.

1       9. A method of distributing multicast messages  
2 associated with a multicast address among ports of a  
3 network device on the basis of virtual local area network  
4 (VLAN), one or more VLANs within the network device are  
5 assigned to the multicast address, each VLAN having a  
6 multicast destination subset which consists of one or more  
7 destination ports assigned from the ports of the network  
8 device, the method comprising the steps of:

9       A. providing a group of multicast destination ports, a  
10 unique index value, one or more VID-select indices assigned  
11 to each destination port, and a plurality of VLAN  
12 identifier (VID) tag lists respectively associated with  
13 each port of the network device;

14       B. looking up the group of multicast destination ports  
15 and the unique index value assigned to the multicast  
16 address in an address lookup table;

17       C. forwarding the multicast messages to the group of  
18 multicast destination ports of the network device; and

19       D. translating one or more VLAN identifiers (VIDs) on  
20 each port in parallel and independently from the unique  
21 index value, one or more VID-select indices and the VID tag  
22 list corresponding to each port of the network device;

23 wherein the group of multicast destination ports are all  
24 of the destination ports assigned to the multicast address  
25 on the network device;

26 wherein the unique index value is assigned to the  
27 multicast address;

28 wherein the VID-select indices are associated with the  
29 unique index value.

1 10. The method as claimed in claim 9, wherein the step A  
2 comprises the steps of:

3 A1. generating the group of multicast destination ports  
4 assigned to the multicast address by collectively combining  
5 every multicast destination subset within all of the VLANs  
6 assigned to the multicast address on the network device;

7 A2. storing the group of multicast destination ports,  
8 the unique index value, and the multicast address in one of  
9 a plurality of entries of the address lookup table, wherein  
10 the group of multicast destination ports are stored in a  
11 bit string of the entry; and

12 A3. storing the VID-select indices in one of a plurality  
13 of VID-select bitmap of a VID-select bitmap table.

1 11. The method as claimed in claim 10, wherein the steps  
2 A1~A3 are performed in response to the Internet Group  
3 Management Protocol (IGMP) service request.

1 12. The method as claimed in claim 10, wherein the step  
2 D comprises the steps of:

3 D1. selecting the VID-select bitmap corresponding to the  
4 unique index value from the VID-select bitmap table;

5 D2. fetching one of the VID-select indices from the VID-  
6 select bitmap independently on each port of the network  
7 device;

8 D3. fetching the VID associated with the multicast  
9 address independently on each port of the network device,  
10 according to the VID-select index from step D2 and the VID  
11 tag list corresponding to each port;

12 D4. repeating step D2 and D3 until each port of the  
13 network device examines all of bits of the VID-select  
14 bitmap.

1 13. The method as claimed in claim 9 further comprising  
2 the step of:

3 E. tagging the related VID on the outgoing multicast  
4 messages independently on every destination port of the  
5 network device.

1 14. The method as claimed in claim 9, wherein the step B  
2 further comprises the step of performing link aggregation  
3 complied with the 802.3ad standard.